

# Shedding light on the biodiversity and ecosystem impacts of modern land use

Jens Dauber<sup>1</sup>, Josef Settele<sup>2</sup>

**1** *Institute of Biodiversity, Johann Heinrich von Thünen-Institute (vTI), Bundesallee 50, 38116 Braunschweig, Germany* **2** *Helmholtz-Centre for Environmental Research – UFZ, Department of Community Ecology, Theodor-Lieser-Str. 4, 06120 Halle, Germany*

Corresponding author: Jens Dauber (jens.dauber@vti.bund.de)

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Bioenergy implications for Biodiversity and Ecosystems, GMO impact monitoring and a tool for the assessment of urban and industrial expansion impacts on riparian habitats are the topics of the present issue of *BioRisk* - three topics from within the field of modern or contemporary land-use developments, representing typical drivers which put biodiversity and ecosystems at risk.

When it comes to the question whether we can fuel the world with feedstock from bioenergy crops without losing the ability to feed a still growing world population of humans, an answer often ready at hand is to turn abandoned and marginal land to agricultural use. This either to increase crop yields in general or to cultivate dedicated energy crops on those lands in order to avoid land-use competition. Those concepts of cultivating or re-cultivating of seemingly surplus land are often based on optimistic assessments in the order of millions of hectares being available globally (German National Academy of Sciences Leopoldina 2012; Offermann et al. 2011). The question whether those estimates of land potentials would bear up against calculations taking environmental and socio-economic constraints into account systematically was adopted in the opinion paper by Dauber et al. (2012; this issue). It is stated in this paper that confusion in the applicability of concepts suggesting the utilization of surplus land for bioenergy crop cultivation is caused by ambiguity in the definition and characterization of surplus land as well by uncertainties in assessments of land availability and of potential yields of bioenergy crops when grown on surplus land. The authors suggest

a thorough reassessment of land availability for bioenergy production by clarifying the terminology of surplus land and taking both constraints and options for an efficient and sustainable bioenergy-land use into account. Bioenergy is *de facto* increasingly developing into a significant part of agricultural land use. Therefore we urgently need more integrated energy, agriculture and land-use policies to circumvent adverse impacts of competition for land. Policy recommendations for resolving conflicting land-use demands suggested by Dauber et al. (2012) comprise first of all a slow-down in the rapid expansion of the bioenergy sector, at least until adequate and effective controls addressing environmental and social impacts such as biodiversity loss, GHG emissions and displacement of local communities are implemented in bioenergy policies. Further steps would include identifying key or focus areas of true surplus land potentials at regional scales through improved baseline knowledge of actual land use and application of this knowledge in comprehensive land-use management guidelines.

To date policies on bioenergy development have not given adequate attention to the potential impacts on biodiversity and ecosystem services (Groom et al. 2008). As land-use change is regarded as one of the major drivers of the ongoing loss of biodiversity, there is a major concern that extensive commercial production of bioenergy feedstock could have negative effects on biodiversity. At the same time, positive effects, in particular of perennial crops, short rotation coppice (SRC) plantations and agroforestry systems, on biodiversity at local scales are reported. As many of those findings are based on studies from experimental sites, significant uncertainties still exist about impacts of full commercial production at the landscape or regional scales (Dauber et al. 2010). To improve our understanding of the effects of commercial SRC cultivation on biodiversity, Baum et al. (2012; this issue) have conducted a study on the species composition of vascular plants in 15 willow and poplar SRC plantations in Central Sweden and Northern Germany. The objective of their study was to evaluate the influences of light availability, plantation age, and soil properties on phytodiversity. Baum et al. (2012) could show that especially plantation age and irradiance play an important role for plant diversity in SRC plantations with different light regimes creating habitats for species with different demands. Thus, measures enhancing the structural diversity of SRC plantations at the local and the landscape scale, such as planting of several small SRC plantations with different rotation regimes and clones in one area, would foster the phytodiversity of agricultural landscapes. Their study provides one example of how creativity in utilizing the options provided by bioenergy feedstock cultivation could lead to an environmentally sustainable development of the bioenergy sector.

Another important topic – when it comes to risks for biodiversity and ecosystems – is the growth of GM crops. In Europe there are many concerns about adverse environmental effects of these crops, and the opinions on the outcomes of environmental risk assessments (ERA) differ largely. GM crop safety testing and introduction studies among the regulatory system are insufficiently developed. Therefore Graef et al. (2012; this issue) propose a framework for a European-wide network for systematic GMO impact assessment (ENSyGMO). This network aims at improving the

regulatory system by enhancing and harmonising the ERA process and post-market environmental monitoring (PMEM) of GM crops in the EU. Specific elements of the network are a) methodologies for both indicator and field site selection for GM crop ERA and PMEM, b) an EU-wide typology of agro-environments, c) a pan-European field testing network using GM crops, d) specific hypotheses on GM crop effects, and e) state-of-the art sampling, statistics and modelling approaches. Involving actors from various sectors, the network will address public concerns and create confidence in the ENSyGMO results.

In the last contribution of this issue, Abboud et al. (2012) have developed a practical approach for impact assessments for riparian habitats – particularly for conditions in Western Asia, namely in Lebanon. Aim is to promote conservation efforts amid destructive and profit driven urban and industrial expansion, where the challenge for national conservation scientists is the reconciliation between scientific ‘rigor’ and pressing national realities. As biodiversity is ranked low on the national priority list, compared to other social, political, and economic issues, the authors propose a rapid management strategy guide based on a habitat assessment tool for riparian ecosystems. The proposed riparian habitat assessment tool (RiHAT) consists of a habitat condition index based on twelve indicators and might show into new directions relevant for countries where assessments of the risks for biodiversity are hardly conducted.

We think that the manuscripts of the present issue nicely represent the scope of the journal and thus hope that these are a good advertisement for BioRisk and make further authors submit their manuscripts.

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